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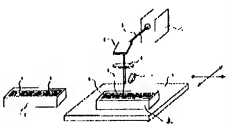
(54) SUBSTRATE CUTTING DEVICE AND SUBSTRATE CUTTING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a substrate cutting device and a substrate cutting method, which can prevent generation of resin scrap and thermal damage due to delaminataion and cutting between mold resin and a substrate in a semiconductor packing, and can perform discrete dicing for a compact package such as a CSP from a substrate without lowering producibility.



SOLUTION: In a division/alignment mechanism part 10 of a substrate 7 having a plurality of packages 8 which contract due to influence of heat treatment in a preceding process, etc., and whose pitch is not constant, a break is formed in an arbitrary position between the packages 8 for correcting a position of the package 8. After a plurality of packages 8 are positioned simultaneously, an area near a peripheral pole of the package 8 is cut by using laser beam 2 and a plurality of packages 8 are continuously subjected to discrete dicing.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the board cutting device and cutting process which are used when separating compact packages, such as two or more ICs formed, for example on one substrate, especially CSP (Chip Scaie Package).

[0002]

[Description of the Prior Art]In order for the spread of portable devices, such as a camcorder/movie and a cellular phone, to progress and to satisfy the demand of a miniaturization of these apparatus in recent years, Development is furthered for CSP (Chip Scaie Package) which miniaturized the package to the size as the bare chip of LSI in which the small size of an LSI package and slimming down are almost the same required therefore in each LSI maker company. Especially the manufacturing method that separates a tape substrate to tape substrates, such as polyimide and glass epoxy, and piece[of an individual]-izes a chip with a wire bond to them after carrying out solder ball attachment, connection, a mold, and, The conventional assembly art is utilized and fertilization is most advanced by being characterized by a compact package being realizable. Conventionally, methods of separating and piece[of an individual]-izing each package from a substrate include the roller cutter method, the punching method by a metallic mold, the **********ing method, the forcing-their way method by an up-and-down flat-blade knife, etc.

[0003]

[Problem(s) to be Solved by the Invention]As mentioned above, although the method of conventional some is proposed as a method of separating each package from one substrate, It is the method of contacting and cutting all to a substrate, and in order to prevent the delamination in which mold resin and a substrate exfoliate in the separated piece of an individual, it is necessary to cut in the position which is separated from a package end, and the outside of a package cannot fully be miniaturized. There was a problem of resin kudzu occurring by cutting. In order to form many compact packages for a short time, it is required to piece--ization[of an individual]-process the substrate with which

two or more packages were formed with high degree of accuracy, but. Since the pitch between packages does not become fixed when contraction of the substrate under the influence of heat treatment by a previous process, etc. arises, in order to piece--ization[of an individual]-process with high precision, after having recognized the position for every package, it was necessary to piece--ization[of an individual]-process, and there was a problem on which productivity is reduced. In the piece-ized processing of an individual using a laser beam, since it became processing by thermal energy, when a thermal damage was given to a package or raising dust things, such as carbon by which it is generated with processing, adhered to it, there was a problem of polluting a package.

[0004]It was made in order that this invention might solve the above problems, and can prevent generating and the thermal damage of resin kudzu by the delamination and cutting between mold resin and a substrate, and. It aims at providing the board cutting device which can piece--ization[of an individual]-process compact packages, such as CPS, from a substrate without reducing productivity. It aims at providing the substrate cutting process which was furthermore suitable for this device.

[0005]

[Means for Solving the Problem]An in-line mechanism part which amends a position of parts and where it is aligned after dividing a board cutting device concerning this invention for every each part article after forming a break between each part articles of a substrate with which two or more parts were formed, It has a transportation means of a substrate which has two or more parts which aligned, and a laser machining section which irradiates a substrate whlch has two or more parts which aligned with a laser beam. Corresponding to each part article, a hole is formed in a substrate at transverse direction both sides of a substrate. An In-line mechanism part is provided with a jig for substrate cutting, and an aligning jig by which a pin corresponding to a hole formed in a substrate was formed in a prescribed position. A jig for substrate cutting is a cutting jig of a contact process. A pin formed in an aligning jig is the tapered shape in which an end was formed in the shape of a tip. A holding jig holding a substrate which a laser machining section is installed on a stage In which horizontal migration is possible, and a stage, and has two or more parts which aligned, It has a nozzle which makes a laser generator which emits a laser beam on a substrate held at a holding jig, and gas sprayed on an irradiation part of a laser beam blow off. A height is provided in a pin formed in an aligning jig at a holding jig, and a corresponding position. Metallic wiring is formed in one field, a solder ball is provided in a field of another side, and a laser beam is irradiated by substrate from the field side in which metallic wiring was formed, and a substrate is constituted from a field side in which a solder ball was provided so that suction holding may be carried out to a holding jig. A crevice corresponding to a solder ball is established in a contact surface with a solder ball of a holdlng jig. A contact surface with a solder ball of a holding jig is constituted by the same material as a component of a substrate. A holding jig is cut and lacked in tapered shape according to a direction of movement of a laser beam so that it may not interfere with a

laser beam which passed a substrate. It has a suction exhaust hole in a periphery of a holding jig, and it is equipped with a mechanism which discharges compulsorily a raising dust thing produced by laser beam exposure. A nozzle which makes gas sprayed on an irradiation part of a laser beam blow off makes gas blow off on a laser beam and the same axle. A laser machining section is provided with two or more nozzles which make gas sprayed on a periphery of parts cut by the exposure of a laser beam blow off. A laser machining section is provided with an optical system which divides into two or more a laser beam emitted from a laser generator and with which a substrate is irradiated.

[0006]A process of furthermore dividing substrate cutting process of this invention for every process of forming a break among parts of a substrate with which two or more parts were formed, or each part article, A process which amends a position of parts and where it is aligned, a process which moves simultaneously a substrate which has two or more parts which aligned to a holding jig on a stage in which horizontal migration is possible, and a process of spraying gas on a substrate held at a holding jig, and irradiating with a laser beam and piece--ization[of an individual]-processing parts are included. Position amendment of parts is performed after forming a break among parts by making a hole provided in both sides of parts fit into a pin formed in a prescribed position of an aligning jig. Or position amendment of parts raises an aligning jig which has a pin in a prescribed position after dividing between parts, and is performed by inserting a pin in a hole provided in both sides of parts. Or position amendment of parts is performed by sliding down a substrate which divided between parts after an end provided in a prescribed position of an aligning jig had inserted in a hole in which a tip of a pin of tapered shape formed in the shape of a tip was established by both sides of parts, and was divided along with a pin of tapered shape. Parts are piece--ization[of an individual]-processed by irradiating with a laser beam to a substrate two or more times according to an optical system which divides into two or more a laser beam emitted from a laser generator and with which a substrate is irradiated.

[0007]

[Embodiment of the Invention]

Below embodiment 1. explains about a figure the board cutting device which is the 1 embodiment of this invention. Drawing 1 is a schematic diagram showing the composition of the board cutting device by the embodiment of the invention 1. The laser beam to which a laser generator and 2 were emitted from the laser generator 1 1 in the figure, The reflective mirror into which 3 reflects in the laser beam 2 emitted from the laser generator 1, and a direction of movement is changed, 4 a condenser and 5 a movable stage and 6 The holding mechanism part on the movable stage 5, The substrate with which the package 8 whose 7 is two or more parts was formed, the divided boards to which 9 divided the substrate 7 into eight units of packages, and 10 divide the substrate 7 into eight units of packages, and. The division and the in-line mechanism part where the divided boards 9 are aligned so that the position of the package 8 on these divided boards 9 may be amended

and the package 8 may be arranged at a position, and 11 are nozzles which make gas blow off. Drawing 2 is a top view showing division and the in-line mechanism part 10. The attaching part in which 12 holds the substrate 7 of division and the in-line mechanism part 10 in a figure, 13 For example, the cutting jig of contact processes, such as a roller cutter, the break by which 14 was formed in the substrate 7 of the cutting jig 13, The hole which made 15 correspond to each package 8, and was provided in the substrate 7, and 16a are the aligning jigs which have two or more pins 17a in a position, and the pin 17a has a path smaller than the path of the hole 15 provided in the substrate 7.

[0008]In the substrate 7 which has two or more packages 8, contraction arises under the influence of heat treatment by a previous process, etc., and the pitch between the packages 8 does not become fixed at it. Therefore, in order to piece--ization[of an individual]-process the package 8 with high precision, it is required to amend the position of the package 8 and to align it first. It is usually large to the longitudinal direction of a substrate, and contraction of the substrate 7 under the influence of heat treatment by a previous process, etc. is so small that it can be disregarded to the transverse direction. Therefore, the physical relationship of the package 8 whlch makes a pair, and the hole 15 becomes always fixed irrespective of contraction of the substrate 7 by forming in the prescribed position of the transverse direction of the substrate 7, and the both sides of the package 8 the hole 15 which each package 8 is made to correspond and is provided a piece every.

[0009]Next, substrate cutting by the board cutting device of this embodiment is explained. As first shown in drawing 2, the substrate 7 which contracts under the influence of heat treatment by a previous process, etc., and has two or more packages 8 whose pitch is not constant, Arrange to the attaching part 12 of division and the in-line mechanism part 10, and by the cutting jig 13 the arbitrary positions between the packages 8, It cuts to the portion which left predetermined length to the neighborhood side which counters by turns from the both sides of the transverse direction from the end of the neighborhood, and the break 14 is formed between each package 8 on the substrate 7 held at the attaching part 12. Next, the divided boards 9 are aligned by carrying out vacuum absorption of the substrate 7 with which the break 14 was formed with a robot (not shown) etc., conveying to the aligning jig 16a which has the pin 17a, and making the hole 15 provided in the pin 17a at the substrate 7 fit in. Since the break 14 is formed in the substrate 7 and it can be extended to a longitudinal direction at this time, The hole 15 provided in the both sides of the package 8 at the pin 17a formed in the prescribed position can be made to be able to fit in, contraction of the longitudinal direction of the substrate 7 under the influence of heat treatment, etc. can be amended, and each package 8 can be arranged with sufficient accuracy to a position. Next, vacuum absorption of the total is simultaneously carried out with a robot (not shown) etc. in the state as it is, and the divided boards 9 positioned by the pin 17a of the aligning jig 16a of division and the in-line mechanism part 10 are arranged to the holding mechanism part 6 on the movable stage 5. The divided boards 9 are held at the

holding jig (not shown) which has a height in the pin 17a formed in the aligning jig 16a of division and the in-line mechanism part 10, and a corresponding position, and have a position gap prevented in the holding mechanism part 6. The path of the height provided in the holding jig is smaller than the path of the hole 15 provided in the both sides of the package 8.

[0010]Next, where the divided boards 9 which were positioned with high precision by the holding mechanism part 6 on the moving stage 5, and were held at it are irradiated with the laser beam 2 which was emitted from the laser generator 1 and condensed by the condenser 4, By moving the movable stage 5 according to the information programmed beforehand, the divided boards 9 are cut near the circumference pole of the package 8, and two or more packages 8 are piece--ization[of an individual]-processed continuously. At the time of divided-boards 9 cutting by laser beam 2 exposure, gas (assist gas) is sprayed on a cut processing part from the nozzle 11, and improvement in the speed of cutting is attained by removing the combustion melt produced in a cut processing part. The exposure of the laser beam 2, spraying of the gas from the nozzle 11, and movement of the movable stage 5 are controlled by one control system according to the information inputted beforehand (not shown [a control system]). As the laser generator 1 used as the heat source for piece [of an indlvidual]-izing the package 8, In CPS (Chip Scale Package) used abundantly as a compact package in recent years. Since it is necessary to carry out cut processing of the resin tape in which resin tapes, such as polyimide resin and a glass base material epoxy resin, are used as that substrate material, the metallic wiring by Cu etc. is formed in that surface, and this metallic wiring was formed, Harmonics (wavelength: lambda=0. 532, 0.266 micrometer, etc.) and high power power of YAG with a high absorptivity over resin and metal can be taken out, and carbon dioxide (CO_2) laser (wavelength: lambda= 10.6 micrometer) with a high absorptivity over resin is suitable. In drawing 2, in order to simplify a figure, it was considered as the three number of the packages 8 provided in the substrate 7, but it is not limited to this. An edged tool metallurgy type may be sufficient as the cutting jig 13 of division and the position in-line mechanism part 10.

[0011]In division and the position in-line mechanism part 10 according to this invention, the substrate 7 which contracts under the influence of heat treatment by a previous process, etc., and has two or more packages 8 whose pitch is not constant, After forming the break 14 in the arbitrary positions between the packages 8, amending the position of the package 8 and positloning two or more packages 8 simultaneously, the laser beam 2 is used, cut processing of the neighborhood of a circumference pole of the package 8 is carried out, and two or more packages 8 are piece--ization[of an individual]-processed continuously. For this reason, in cutting of the substrate 7 in division and the in-line mechanism part 10. Also when the interval of the adjoining package 8 fully cuts the substrate 7 by a contact method for a certain reason, problems, such as delamination in which mold resin and the substrate of the package 8 exfoliate, and an adverse effect to the package 8 by generating of resin waste, are not produced. Since two or more packages 8 are positioned

simultaneous and with high precision, two or more packages 8 can be piece--ization[of an individual]-processed continuously, and piece-ized processing of an individual of the package 8 can be performed in high degree of accuracy and a short time.

[0012]Embodiment 2. drawing 3 is a perspective view of division and the in-line mechanism part of the board cutting device in which this embodiment of the invention 2 is shown. In the figure, it is the position aligning jig of the substrate 7 with which 18 was held at the holder part of the cutting jig 13, and 16b was held at the attaching part 12 caudad provided corresponding to each package 8 so that it might be movable according to each, and the position of all the aligning jigs 16b of division and the in-line mechanism part 10 is positioned with high precision. 17b is the pin formed in the position of the aligning jig 16b, and has a path smaller than the path of the hole 15 provided in the both sides of the package 8. Since other composition is the same as that of Embodiment 1, explanation is omitted.

[0013]Next, division of the substrate 7 by division and the in-line mechanism part 10 of the board cutting device of this embodiment and position amendment of the divided boards 9 are explained. As first shown in drawing 3-(b), it contracts under the influence of heat treatment by a previous process, etc., the substrate 7 which has two or more packages 8 whose pitch is not constant is arranged to the attaching part 12 of division and the in-line mechanism part 10, and the cutting jig 13 cuts the arbitrary positions between the packages 8. Next, the divided boards 9 divided by the cutting jig 13 as shown in drawing 3-(**), By inserting the pin 17b formed in the position of the aligning jig 16b which has gone up in the hole 15 provided in the both sides of the package 8 of the divided boards 9, the position of the divided boards 9 is amended and the package 8 is positioned with high precision on the aligning jig 16b. Then, all the packages 8 on the substrate 7 held at the attaching part 12 of division and the in-line mechanism part 10 are divided one by one, and it positions by the pin 17b of the aligning jig 16b. Next, vacuum absorption of the total is simultaneously carried out with a robot (not shown) etc. in the state as it is, and the divided boards 9 positioned by the pin 17b of the aligning jig 16b of division and the in-line mechanism part 10 are arranged to the holding mechanism part 6 on the movable stage 5. Then, the package 8 is piece--ization[of an individual]-processed by the same method as Embodiment 1.

[0014]In division and the in-line mechanism part 10 according to this embodiment, the substrate 7 which contracts under the influence of heat treatment by a previous process, etc., and has two or more packages 8 whose pitch is not constant, The position of the package 8 is amended by inserting the pin 17b formed in the aligning jig 16b after cutting in the arbitrary positions between the packages 8 in the hole 15 in which it was provided to the both ends of the package 8, Since two or more positioned packages 8 can be positioned simultaneous and with high precision to the holding mechanism part 6 on the movable stage 5 which piece--ization[of an individual]-processes the package 8 by the laser beam 2 and can be arranged to it, the same effect as Embodiment 1 can be acquired.

[0015]Embodiment 3. drawing 4 is a perspective view of division and the in-line mechanism part of the board cutting device in which this embodiment of the invention 3 is shown. Drawing 5 is a perspective view showing the aligning jig of division and an in-line mechanism part. In the figure, 16c is an aligning jig which has the pin 17c of tapered shape In a position, with the accuracy of position included in the hole 15 by which the tip of the pin 17c was established in the substrate 7 held at the attaching part 12, is positioned with high precision by the lower part of the substrate 7, and is arranged at it. Since other composition is the same as that of Embodiment 1, explanation is omitted.

[0016]Next, division of the substrate 7 by division and the in-line mechanism part 10 of the board cutting device of this embodiment and position amendment of the divided boards 9 are explained. The substrate 7 which contracts under the influence of heat treatment by a previous process, etc. first, and has two or more packages 8 whose pitch is not constant, It arranges to the attaching part 12 so that the tip of the pin 17c established in the aligning jig 16c of division and the in-line mechanism part 10 may go into the hole 15 provided in the both sides of the package, and the cutting jig 13 cuts the arbitrary positions between the packages 8. The divided boards 9 divided by the cutting jig 13 are slid down along with the pin 17c which has tapered shape, and the package 8 on the divided boards 9 is positioned with high precision on the position aligning jig 16c. Then, all the packages 8 on the substrate 7 held at the attaching part 12 of division and the in-line mechanism part 10 are divided one by one, and it positions by the pin 17c of the aligning jig 16c. Next, vacuum absorption of the total is simultaneously carried out with a robot (not shown) etc. in the state as it is, and the divided boards 9 positioned by the pin 17c of the aligning jig 16c of division and the in-line mechanism part 10 are arranged to the holding mechanism part 6 on the movable stage 5. Then, the package 8 is piece--ization[of an individual]-processed by the same method as Embodiment 1.

[0017]In division and the in-line mechanism part 10 according to this embodiment, the substrate 7 which contracts under the influence of heat treatment by a previous process, etc., and has two or more packages 8 whose pitch is not constant, When a tip slides down the divided boards 9 after cutting along with the pin 17c of the tapered shape of the aligning jig 16c inserted in the hole 15 in which it was provided by the both sides of the package 8 in the arbitrary positions between the packages 8, the position of the package 8 is amended, Since two or more positioned packages 8 can be positioned simultaneous and with high precision to the holding mechanism part 6 on the movable stage 5 which piece--ization[of an individual]-processes the package 8 by the laser beam 2 and can be arranged to it, the same effect as Embodiment 1 can be acquired.

[0018]Embodiment 4. drawing 6 is a sectional view of the holding mechanism part of the divided boards in the laser machining section of the board cutting device in which this embodiment of the invention 4 is shown. The holding jig in which 6b holds the divided boards 9 of the holding mechanism part 6 in a figure, The metallic wiring in which 20 is

formed in the divided boards 9, the resin substrate whose 21 is a substrate material of the divided boards 9, The solder ball in which 22 is provided in the rear-face side (opposite hand of package 8 and metallic wiring 20 forming face) of the divided boards 9, and 23 are piping provided in the holding jig 6b, in order to carry out vacuum absorption of the divided boards 9. Since other composition is the same as that of either of the Embodiments 1, 2, and 3, explanation is omitted.

[0019]The divided boards 9 which have the package 8 positioned with high precision in division and the in-line mechanism part 10, It is held only in the rear-face side center section of the divided boards 9 so that it may be arranged, and the vacuum absorption of the field in which the metallic wiring 20 is formed may be turned upward at the holding jig 6b on the movable stage 5 piece--ization[of an individual]-processed by the exposure of the laser beam 2 and the solder ball 22 may not be damaged. It irradiates with the laser beam 2 from the upper part in this state, the divided boards 9 are cut near the circumference pole of the package 8, and the package 8 is piece--ization[of an individual]-processed. If the phenomenon of the depth direction of cutting at the time of divided-boards 9 cutting is observed in micro, After cutting the metallic wiring 20 which needs more cutting energies by the laser beam 2 than the resin substrate 21, the resin substrate 21 is cut, and after cutting the resin substrate 21, the package 8 can be piece--ization[of an individual]-processed from the divided boards 9 with irradiation energy less than the case where the metallic wiring 20 is cut.

[0020]According to this embodiment, carry out suction holding of the field side where the divided boards 9 are formed in the solder ball 22, and. Since-izing of the package 8 can be carried out [the piece of an individual] in less exposure ERERUGI by irradiating with and cutting the laser beam 2 from the side in which the metallic wiring 20 is formed, the thermal damage to the package 8 can be reduced.

[0021]In the embodiment 5. embodiment 4, the divided boards 9 were held only in the rear-face side center section of the divided boards 9 at the holding jig 6b so that the solder ball 22 might not be damaged, but. By establishing the crevice 24 corresponding to the solder ball 22 in the contact surface with the solder ball 22 provided in the divided boards 9 of the holding jig 6c, as shown in drawing 7, Since it is not restricted to the formation posltion of the solder ball 22, the contact surface of the divided boards 9 and the holding jig 6c, Without being dependent on the number and formation area of the solder ball 22 which are established in the package 8, And since the contact surface of the divided boards 9 and the holding jig 6c can be secured and the divided boards 9 can be held from the solder ball 22 side to the holding jig 6c, without damaging the solder ball 22, the same effect as Embodiment 4 is acquired. The number and the formation area of the crevice 24 which were shown in drawing 7 are not limited to this.

[0022]In the embodiment 6. embodiment 4, the divided boards 9 were held only in the rear-face side center section of the divided boards 9 at the holding jig 6b so that the solder ball 22 might not be damaged, but. By forming the resin substrate 21 which is a substrate

material of the divided boards 9, and the member 25 of same material in a contact surface with the solder ball 22 provided in the divided boards 9 of 6 d of holding jigs, as shown in drawing 8, Since it is not restricted to the formation position of the solder ball 22, the contact surface of the divided boards 9 and 6 d of holding jigs, Even when the solder ball 22 is formed in the whole surface, without damaging the solder ball 22, the divided boards 9 can be held from the solder ball 22 side to 6 d of holding jigs, and the same effect as Embodiment 4 is acquired. The crevice 24 corresponding to the solder ball 22 may be established in the member 25.

[0023]Embodiment 7. drawing 9 is a sectional view of the holding mechanism part of the laser machining section of the board cutting device in which this embodiment of the invention 7 is shown. In a figure, 6e is a holding jig cut and lacked in the direction of the lower part so that it may not interfere with the laser beam 26 which cut the divided boards 9 and was penetrated at the time of laser beam 2 exposure. Since other composition is the same as that of either of the Embodiments 1, 2, and 3, explanation is omitted.

[0024]In the cutting process of the divided boards 9 by the laser beam 2, if the laser beam 2 condensed by the condenser 4 cuts the divided boards 9 and penetrates, it extends the beam diameter as light advances. By using the holding jig 6e cut and lacked in the direction of the lower part so that it might not hit the spreading laser beam 26, the rise in heat of the holding jig 6e by the laser beam 26 hitting can be prevented. Which holding jigs [which were shown in Embodiments 4, 5, and 6 / 6b, 6c, and 6d] structure may be sufficient as the structure of the contacting parts of the solder ball 22 and the holding jig 6e which were provided in the divided boards 9.

[0025]According to this embodiment, by cutting and lacking the holding jig 6e in the direction of the lower part so that it may not hit the laser beam 26 which cut the divided boards 9 and was penetrated, the rise in heat of the holding jig 6e can be prevented, and the thermal damage of the package 8 which touches the holding jig 6e can be reduced. The cooler style provided for the purpose of thermal damage reduction of the package 8 by the rise in heat of the holding jig 6e is omissible.

[0026]Embodiment 8. drawing 10 is a sectional view of the holding mechanism part of the laser machining section of the board cutting device in which this embodiment of the invention 8 is shown. In the figure, 27 is the frame installed so that the circumference of the holding jig 6e might be surrounded, and has the breakthrough 28 for vacuum suction. Since other composition is the same as that of either of the Embodiments 1, 2, and 3, explanation is omitted. Holding jigs [which were shown in Embodiments 4, 5, and 6 / 6b, 6c, and 6d] one of structures may be sufficient as the holding jig 6e.

[0027]In the cutting process of the divided boards 9 by the laser beam 2, when the laser beam 2 cuts the metallic wiring 20 and the resin substrate 21, raising dust things, such as carbon, arise. The frame 27 is installed so that the circumference of the holding jig 6e may be surrounded, and vacuum suction is performed via the breakthrough 28 formed in the frame 27, and it discharges from the field which is carrying out cut processing of these

raising dust things.

[0028]According to this embodiment, install the frame 27 so that the circumference of the holding jig 6e which holds the divided boards 9 at the time of laser beam machining may be surrounded, and. By discharging the raising dust thing produced via the breakthrough 28 formed in the frame 27 at the time of divided-boards 9 cutting, a raising dust thing adheres to the package 8, and it can prevent polluting the package 8.

[0029]Embodiment 9. drawing 11 is a sectional view of the laser machining section of the board cutting device in which this embodiment of the invention 9 is shown. In a figure, the nozzle from which 29 sprays the assist gas 30 on the cut processing part of the divided boards 9 by the laser beam 2 on the laser beam 2 and the same axle, and 31 are nozzles which spray the gas 32 in the direction of an end of the package 8 near the cut processing part of the divided boards 9 by the laser beam 2. Since other composition is the same as that of Embodiment 8, explanation is omitted.

[0030]In the cutting process of the divided boards 9 by the laser beam 2, the assist gas 30 which contributes to improvement in the speed of cut processing from the nozzle 29 at the cut processing part of the divided boards 9 is sprayed. Since it is necessary to spray the assist gas 30 vertically to a cutting plane and so that there may be no anisotropy, and it is necessary to spray the cut processing part by the laser beam 2, the nozzle 29 is constituted so that the assist gas 30 can be spouted on the laser beam 2 and the same axle. Two or more nozzles 31 are installed corresponding to the circumference of the package 8, make the gas 32 blow off only from the nozzle 31 corresponding to the portion into which cut processing is performed in the direction of an end of the package 8 near the cut processing part, and prevent adhesion in the package 8 of the raising dust thing by cut processing. The raising dust thing blown away by the gas 32 spouted from the nozzle 31 is discharged via the breakthrough 28 which was formed in the frame 27 installed so that the circumference of the holding jig 6e might be surrounded and by which vacuum suction is carried out.

[0031]According to this embodiment, by spouting the assist gas 30 on the laser beam 2 and the same axle from the nozzle 29, the combustion melt produced in a cut processing part can be removed, and improvement in the speed of cutting can be attained at the time of laser beam machining. Adhesion in the package 8 of the raising dust thing by cut processing is prevented by installing two or more nozzles 31 which make the gas 32 blow off in the direction of an end of the package 8 near the cut processing part corresponding to the circumference of the package 8. Antisticking to the package 8 of a raising dust thing has an effect further by discharging the raising dust thing blown away by the gas 32 spouted from the nozzle 31 via the breakthrough 28 formed in the frame 27 installed so that the circumference of the holding jig 6e might be surrounded.

[0032]Embodiment 10. drawing 12 is a sectional view of the laser machining section of the board cutting device in which this embodiment of the invention 10 is shown. In a figure, 3a reflects the laser beam 2 emitted from the laser generator 1 50%, And the partial reflection mirror which makes the remaining 50% penetrate, the total reflection mirror in which 3b

reflects the transmitted light from the partial reflection mirror 3a, The condenser to which 4a makes a cut processing part condense the laser beam 2a reflected by the partial reflection mirror 3a, and 4b are the condensers which make a cut processing part condense laser beam 2b reflected by the total reflection mirror 3b, It is being fixed and the reflective mirrors 3a and 3b and the condensers 4a and 4b irradiate with the laser beam 2a and 2b which were condensed by the position. The divided boards in which the packages 8a and 8b were formed as for 9a and 9b, and 33 are dummy substrates. Since other composition is the same as that of either of the above-mentioned embodiments, explanation is omitted.

[0033]In the cutting process of the divided boards 9a and 9b by the laser beam 2a and 2b, When the laser beam 2a which was first reflected by the partial reflection mirror 3a, and was condensed by the condenser 4a is irradiated by the dummy substrate 33, By being reflected by the total reflection mirror 3b, being irradiated with laser beam 2b condensed by the condenser 4b by the divided boards 9a arranged next to the dummy substrate 33, and moving the movable stage 5 in which the divided boards 9a and 9b were carried, The circumference of the package 8a is irradiated with laser beam 2b. Next, irradiate the divided boards 9a with the laser beam 2a which made move in the movable stage 5 in which the divided boards 9 were carried, was reflected by the partial reflection mirror 3a, and was condensed by the condenser 4a, and. By being reflected by the total reflection mirror 3b, being irradiated with laser beam 2b condensed by the condenser 4b by the divided boards 9b arranged next to the divided boards 9a, and moving the movable stage 5 in which the divided boards 9a and 9b were carried, The circumference of the package 8a and the package 8b is irradiated with the laser beam 2a and 2b. The divided boards 9a are cut by the exposure of the two times of the laser beam 2a and 2b, and the package 8a is piece[of an individual]-ized. The movable stage 5 is moved, cut processing processing is repeated, and the package 8 is piece--ization[of an individual]-processed one by one by the exposure of the two times of the laser beam 2a and 2b.

[0034]Although the divided boards 9 were cut by the exposure of the laser beam 2 of two times and the case where the package 8 was piece[of an individual]-ized was shown by this embodiment, it is not limited to two times. Number m of the package 8 in which the scanning frequency n of the laser beam 2 required to piece-ization[of an individual]-process altogether the divided boards 9 held at the holding mechanism part 6 of the laser machining section was held at the n=k+(m-1) k:holding mechanism part 6: It becomes the number of times of an exposure required to carry out cut processing of the divided boards 9.

[0035]Since according to this embodiment energy required in order to cut divided-boards 9 and to piece[of an individual]-ize the package 8 is divided into multiple times and it irradiates with it, the thermal damage to the package 8 can be reduced.

[0036]

[Effect of the Invention]As mentioned above, according to this invention, it contracts under the influence of heat treatment by a previous process, etc., The pitch of the package of the

substrate which has two or more packages whose pitch is not constant is amended, After positioning two or more packages simultaneously, in order to use a laser beam, to carry out cut processing of the neighborhood of a circumference pole of a package and to piece--ization[of an individual]-process a package, Generating of the delamination and resin waste in which mold resin and the substrate of a package exfoliate can be prevented, and compact packages, such as CSP, can be piece--ization[of an individual]-processed in high degree of accuracy and a short time. According to Claims 8, 9, 10 and 11, and 13 and 15, the thermal damage to a package can be reduced. According to Claim 12, and 14 and 20, adhesion of a raising dust thing etc. in a package can be prevented.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]A cutting device of a substrate characterized by comprising the following.
An in-line mechanism part which amends a position of each part article and where it is aligned after dividing for every each part article after forming a break between each part articles of a substrate with which two or more parts were formed.
A transportation means of a substrate which has two or more parts which it aligned [above-mentioned].
A laser machining section which irradiates with a laser beam a substrate which has two or more parts which it aligned [above-mentioned].

[Claim 2]A cutting device of the substrate according to claim 1 which carries out that a hole is formed in transverse direction both sides of the above-mentioned substrate corresponding to each part article to a substrate with the feature.
[Claim 3]A cutting device of the substrate according to claim 2 characterized by comprising the following.
An in-line mechanism part is a jig for substrate cutting.
An aligning jig by which a pin corresponding to a hole formed in a substrate was formed in a prescribed position.

[Claim 4]A cutting device of the substrate according to claim 3, wherein a jig for substrate cutting is a cutting jig of a contact process.
[Claim 5]A cutting device of the substrate according to claim 3 or 4, wherein a pin formed in an aligning jig is the tapered shape in which an end was formed in the shape of a tip.
[Claim 6]A cutting device of a substrate of Claims 1-5 given in any 1 paragraph characterized by comprising the following.
A stage in which horizontal migration of a laser machining section is possible.
A holding jig holding a substrate which is installed on the above-mentioned stage and has two or more parts which it aligned [above-mentioned].

A laser generator which emits a laser beam on the above-mentioned substrate held at the above-mentioned holding jig.
A nozzle which makes gas sprayed on an irradiation part of the above-mentioned laser beam blow off.

[Claim 7]A cutting device of the substrate according to claim 6 characterized by providing a height in a pin formed in an aligning jig, and a corresponding position at a holding jig.
[Claim 8]Metallic wiring is formed in one field at a substrate, and a solder ball is provided in a field of another side.
A cutting device of the substrate according to claim 6 or 7, wherein the above-mentioned substrate comprises a field side in which a laser beam was irradiated from the field side in which the above-mentioned metallic wiring was formed, and the above-mentioned solder ball was provided so that suction holding may be carried out to a holding jig.

[Claim 9]A cutting device of the substrate according to claim 8, wherein a crevice corresponding to the above-mentioned solder ball is established in a contact surface with a solder ball of a holding jig.
[Claim 10]A cutting device of the substrate according to claim 8 or 9, wherein a contact surface with a solder ball of a holding jig is constituted with the same material as a component of the above-mentioned substrate.
[Claim 11]A cutting device of a substrate of Claims 6-10 cutting and lacking a holding jig in tapered shape according to a direction of movement of the above-mentioned laser beam so that it may not interfere with a laser beam which passed the above-mentioned substrate given in any 1 paragraph.
[Claim 12]A cutting device of a substrate of Claims 6-11, wherein a laser machining section is provided with a mechanism which discharges compulsorily a raising dust thing which has a suction exhaust hole in a periphery of a holding jig, and was produced by laser beam exposure given in any 1 paragraph.
[Claim 13]A cutting device of a substrate of Claims 6-12, wherein a nozzle which makes gas sprayed on an irradiation part of a laser beam blow off makes the above-mentioned gas blow off on the above-mentioned laser beam and the same axle given in any 1 paragraph.
[Claim 14]A cutting device of a substrate of Claims 6-13, wherein a laser machining section is provided with two or more nozzles which make gas sprayed on a periphery of parts cut by the exposure of a laser beam blow off given in any 1 paragraph.
[Claim 15]A cutting device of a substrate of Claims 6-14, wherein a laser machining section is provided with an optical system which divides into two or more a laser beam emitted from a laser generator and with which a substrate is irradiated given in any 1 paragraph.
[Claim 16]A process divided for every process of forming a break between each part articles of a substrate with which two or more parts were formed, or each part article, A

process which amends a position of the above-mentioned parts and where it is aligned, and a process of moving simultaneously a substrate which has two or more parts which it aligned [above-mentioned] to a holding jig on a stage in which horizontal migration is possible, Cutting process of a substrate including a process of spraying gas on the above-mentioned substrate held at the above-mentioned holding jig, and irradiating with a laser beam and piece--ization[of an individual]-processing the above-mentioned parts.

[Claim 17]Cutting process of the substrate according to claim 16 performing position amendment of parts by making a hole provided in both sides of the above-mentioned parts fit into a pin formed in a prescribed position of an aligning jig after forming a break among the above-mentioned parts.

[Claim 18]Cutting process of the substrate according to claim 16 performing position amendment of parts by inserting the above-mentioned pin in a hole which raised an aligning jig which has a pin in a prescribed position after dividing between the above-mentioned parts, and was provided in both sides of the above-mentioned parts.

[Claim 19]Position amendment of parts a tip of a pin of tapered shape in which an end provided in a prescribed position of an aligning jig was formed in the shape of a tip, Cutting process of the substrate according to claim 16 carrying out by sliding down the above-mentioned substrate which divided between the above-mentioned parts in the state where it inserted in a hole provided in both sides of the above-mentioned parts, and was divided along with a pin of the above-mentioned tapered shape.

[Claim 20]Cutting process of a substrate of Claims 16-19 piece--ization[of an individual]-processing parts by irradiating with a laser beam to the above-mentioned substrate two or more times according to an optical system which divides into two or more a laser beam emitted from a laser generator, and with which a substrate is irradiated given in any 1 paragraph.

[Translation done.]

し、パッケージ8を個片化するために必要なエネルギーを複数回に分けて照射するため、パッケージ8への熱的ダメージを低減させることができる。

【0036】

【発明の効果】以上のように、この発明によれば、前工程での熱処理の影響等により収縮し、ピッチが一定でない複数個のパッケージを有する基板のパッケージのピッチを補正し、複数個のパッケージを同時に位置決めした後に、レーザビームを用いてパッケージの周辺極近傍を切断加工してパッケージを個片化処理するため、パッケージのモールド樹脂と基板が剥離するデラミネーションや樹脂くずの発生を防止できると共に、CSP等の小型パッケージを、高精度かつ短時間で個片化処理することができる。また、請求項8、9、10、11、13および15によれば、パッケージへの熱的ダメージを低減させることができる。さらに、請求項12、14および20によれば、パッケージへの発塵物等の付着を防止することができる。

【図面の簡単な説明】

【図1】　この発明の実施の形態1による基板切断装置を示す概略図である。

【図2】　この発明の実施の形態1による分割・整列機構部を示す平面図である。

【図3】　この発明の実施の形態2による分割・整列機構部を示す斜視図である。

【図4】　この発明の実施の形態3による分割・整列機構部を示す斜視図である。

【図5】　この発明の実施の形態3による分割・整列機構部を示す斜視図である。

【図6】　この発明の実施の形態4による基板切断装置の基板保持機構部を示す断面図である。

【図7】　この発明の実施の形態5による基板切断装置の基板保持機構部を示す断面図である。

【図8】　この発明の実施の形態6による基板切断装置の基板保持機構部を示す断面図である。

【図9】　この発明の実施の形態7による基板切断装置の基板保持機構部を示す断面図である。

【図10】　この発明の実施の形態8による基板切断装置の基板保持機構部を示す断面図である。

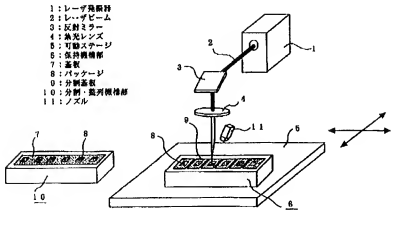
【図11】　この発明の実施の形態9による基板切断装置のレーザ加工部を示す断面図である。

【図12】　この発明の実施の形態10による基板切断装置のレーザ加工部を示す斜視図である。

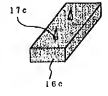
【符号の説明】

1　レーザ発振器、2、2a、2b　レーザビーム、3　反射ミラー、3a　部分反射ミラー、3b　全反射ミラー、4、4a、4b　集光レンズ、5　可動ステージ、6　保持機構部、7　基板、8　パッケージ、9　分割基板、10　分割・整列機構部、11　ノズル、12　保持部、13　切断治具、14　切れ目、15　穴部、16a、16b、16c、16d、16e　整列治具、17a、17b、17c　ピン、18　受け部、20　金属配線、21　樹脂基板、22　半田ボール、23　配管、24　凹部、25　部材、26　レーザビーム、27　枠、28　貫通孔、29　ノズル、30　アシストガス、31　ノズル、32　ガス、33　ダミー基板。

【図1】



【図5】



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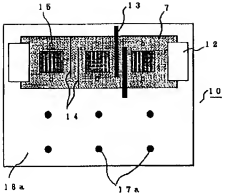
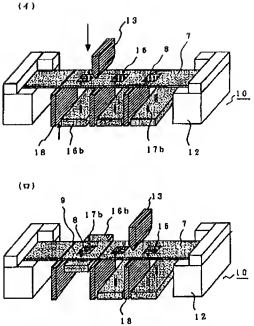
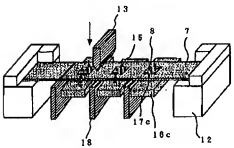

15
13
7
12
10
14
18a
17a

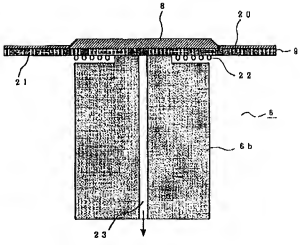
【図3】


(イ)
13
15
8
7
10
18
16b
17b
12
(ロ)
9
8
17b
16b
13
15
7
10
18
12

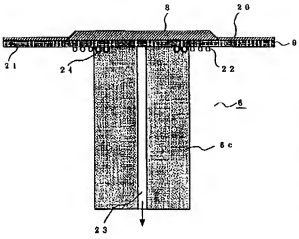
【図4】


13
15
8
7
17c
16c
18
12

【図6】


8
20
9
21
22
5
6b
23

【図7】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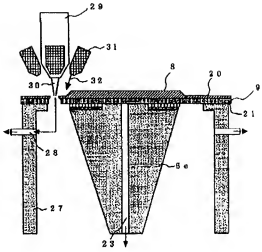
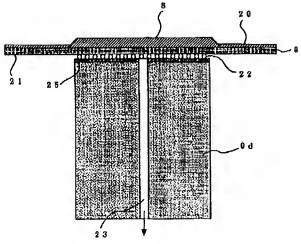
20
9
21
24
22
6
6c
23

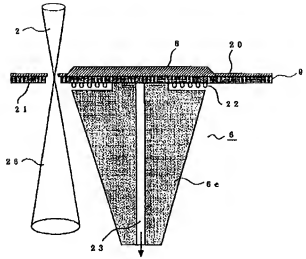
【図11】


29
31
32
30
8
20
9
21
28
6e
27
23

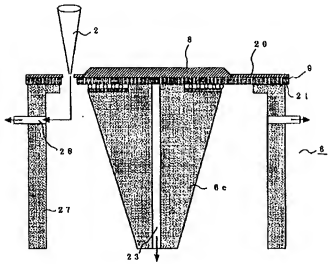
【図8】


8
20
9
21
25
22
6d
23

【図9】



【図10】



【図12】